

Speech Alarms Pilot Study

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Currently on the International Space Station (ISS) and other space vehicles Caution & Warning (C&W) alerts are represented with various auditory tones that correspond to the type of event. This system relies on the crew's ability to remember what each tone represents in a high stress, high workload environment when responding to the alert. Furthermore, crew receive a year or more in advance of the mission that makes remembering the semantic meaning of the alerts more difficult. The current system works for missions conducted close to Earth where ground operators can assist as needed. On long duration missions, however, they will need to work off-nominal events autonomously. There is evidence that speech alarms may be easier and faster to recognize, especially during an off-nominal event.

The Information Presentation Directed Research Project (FY07-FY09) funded by the Human Research Program included several studies investigating C&W alerts. The studies evaluated tone alerts currently in use with NASA flight deck displays along with candidate speech alerts. A follow-on study used four types of speech alerts to investigate how quickly various types of auditory alerts with and without a speech component - either at the beginning or at the end of the tone - can be identified. Even though crew were familiar with the tone alert from training or direct mission experience, alerts starting with a speech component were identified faster than alerts starting with a tone.

The current study replicated the results from the previous study in a more rigorous experimental design to determine if the candidate speech alarms are ready for transition to operations or if more research is needed. Four types of alarms (caution, warning, fire, and depressurization) were presented to participants in both tone and speech formats in laboratory settings and later in the Human Exploration Research Analog (HERA). In the laboratory study, the alerts were presented by software and participants were asked to identify the alert as quickly and as accurately as possible. Reaction time and accuracy were measured. Participants identified speech alerts significantly faster than tone alerts. The HERA study investigated the performance of participants in a flight-like environment. Participants were instructed to complete items on a task list and respond to C&W alerts as they occurred. Reaction time and accuracy were measured to determine if the benefits of speech alarms are still present in an applied setting.